Charges, Costs and Market Power in the Deregulated UK Electricity Retail Market

by
Evens Salies
Economics Department, City University
and
Catherine Waddams Price*
CCR and School of Management, University of East Anglia

CCR Working Paper CCR 03-6

Abstract

The UK energy regulator claims that prices are set by competitive forces in unregulated residential energy markets. We assess the competitiveness of the market by examining how the charges levied by suppliers depend on cost and demand factors for three different payment methods and consumption levels. We also identify any additional market power of incumbency and the effect of levying a tariff with no fixed charge. Data are the tariffs offered in April 2002 in the 14 electricity regions of Great Britain by seventeen suppliers, seven of whom operate nationally. We find that both cost and demand factors affect charges, and the relationship varies for different payment methods and consumption levels; and that tariffs with no fixed element have different effects for different payment methods. We conclude that considerable market power remains, that its nature varies between payment methods and that there are potentially adverse distributional effects.

November 2003

JEL Classification: L13, L51 and L94
Key words: Energy: Pricing, Market Power

Acknowledgements:
We are grateful for financial support from the Economic and Social Research Council (project RO22250206) and the Leverhulme Trust (project F215/AX); the research was undertaken when both authors were at the Centre for Competition and Regulation at the University of East Anglia. We thank: Colin Green from Ofgem, for help with regional data; Stephen Davies, Morten Hviid, Peter Moffatt, Diane Sharratt, participants at the 6th annual conference of the Network of Industrial Economists in London, the 7th ERC/METU International Conference in Economics, Ankara/Turkey, the University of California Energy Institute Summer Camp 2003 at Berkeley, and participants in the end of project ESRC seminar at the University of East Anglia for helpful comments on earlier versions of this paper, entitled Pricing Structures in the Deregulated UK Electricity Market. We are particularly grateful to two anonymous referees for valuable suggestions on motivating our analysis. The authors accept responsibility for any remaining errors.

*Corresponding author: University of East Anglia, Norwich NR4 7TJ, UK; t: +44 (0) 1603 593740; f: +44(0) 1603 593343; e: c.waddams@uea.ac.uk

ISSN 1473-8473

1. Introduction and Background

This paper investigates the final prices charged to residential consumers in the UK for electricity, one of the basic utilities, on the date when the final price constraints were removed from these tariffs in April 2002. The regulator believed that there was sufficient competition to move from ex ante price regulation to ex post review of behaviour and has since claimed that "prices today are set by competitive forces" (Ofgem, 2003, p.53). We examine the charges made in these markets and their relation to costs and other market characteristics as an indication of how developed the competitive process was at that time.

The energy regulator has both a role 'to promote choice and value for all consumers' (Ofgem website, 2003) and a duty to take account of the interests of low income consumers (Utilities Act, 2000). As for all necessities, low income groups spend a higher than average proportion of their income on utilities, but consume a lower absolute quantity of energy than those who are richer. Prices for different consumption levels and payment methods therefore also have important and politically sensitive distributional consequences, witnessed by a history of political intervention in nationalised industry tariffs, and a combination of government and regulatory influence in their privatised successors.

The electricity supply industry is vertically divided into four stages: generation; high voltage, long distance transmission; regional distribution; and the retail function (sales and billing). At privatisation the distribution and retail functions were jointly vested in fourteen regional companies, but these functions have recently been divided into separate organisations and have subsequently devolved to different owners in many regions. A company retailing electricity pays charges to the three upstream providers, i.e. to a generator for the energy, to National Grid Transco for transmission through the network, and to a distribution company for local transport (the supply company may be vertically integrated with either a distribution or a generation provider, or both). The retail function itself is primarily procurement of energy, and billing and collection of payment.

Costs of retailing depend on payment method. The three payment methods are standard credit (payment in arrears after receipt of a quarterly bill); direct debit (monthly amounts deducted directly from a consumer's bank account); and prepayment, where supply is activated by insertion in the meter of a precharged 'smart card' or key. Automated direct debit is the cheapest for the retail company to operate, and prepayment the most expensive because of the cost of handling frequent

small cash transactions. In addition, prepayment sometimes incurs an additional distribution charge for the retailer.

When the retail part of energy markets was first opened to competition (from 1998 for households) most commentators predicted that prices would become more cost reflective. The nationalised area boards, predecessors to the regional electricity companies, had interpreted their 'public service' obligations by implementing widespread cross-subsidies through average cost pricing. This meant that consumers with high costs (those living in rural areas, consuming at times of peak demand, paying late or using more expensive prepayment meters) were subsidised by those with lower costs. Once the retail market was separated from distribution (which remains a monopoly), the cross-subsidies in the retail sector would be eroded (see Waddams Price and Hancock, 1998). This has occurred most obviously for payment method in energy.

Following the introduction of competition to all parts of the retail electricity market in May 1999, price constraints were removed from the direct debit market in April 2000, but prices charged to standard credit and prepayment consumers by incumbents in their home market remained capped until 2002, as did the difference between the charges made for these two payment methods. This restriction varies between regions, and is discussed further when we report our results.

The regulator, Ofgem, has undertaken periodic reviews of the development of the market since price regulation was removed. In December 2002 (Ofgem, 2002) an analysis at aggregate level showed that the gap between incumbent and entrant prices in the residential electricity market was, if anything, widening, and that the best offers below the incumbent's price varied from 7 to 17%. Another report, six months later (Ofgem, 2003), extended the discussion to savings at different consumption levels, as does our analysis, showing lower percentage discounts and opportunities to save from switching away from the incumbent at lower consumption levels. Our paper tests Ofgem's assertion that prices are set by competitive forces by assessing the relation between prices and costs at a much more disaggregated level, analysing the individual charges levied by each 'brand' and in each region, and relating these to a variety of cost and demand factors at different consumption levels.

This analysis enables us to assess the extent of general market power in the retail market by examining how far charges are determined by different cost and market factors. If the retail sector is strongly competitive we would expect cost factors to predominate, with upstream costs largely passed through 100% in the long run. Any oligopoly power in this increasingly concentrated sector

would be indicated by demand factors having a significant effect on prices; while market power of the incumbent over and above such generalised oligopoly power, might be captured by higher charges levied by incumbents.

In the next section we describe the data. Section 3 presents the methodology, section 4 the results and section 5 the conclusions.

2. Data

The companies whose charges we examine are the surviving electricity incumbents and some new entrants to the industry. Not all companies operate in all regions, but there were seven former Public Electricity Suppliers operating nationwide, using thirteen of the brand names. The other four brands are entrants to the market, by far the largest of which, British Gas, is the incumbent in the gas market. The fourteen regions are those in England, Scotland and Wales which were formerly defined by Public Electricity Suppliers. The most common tariff is one with a standing charge which is independent of the consumption level, and a single rate for each unit consumed. We have also included tariffs with no standing charge, but with a high unit charge for the first few units, and tariffs with a standing charge and two running rates, and have tested whether such multipart tariffs generally result in higher or lower charges for each payment method and consumption level.

We use as the dependent variable the charges levied to consumers at three levels of annual demand: 1650, 3300 and 4950 kilowatt hours (kWh), defined as low, medium and high levels of residential consumption by *energywatch*, the consumer body for the industry. We account for differences in tariff structure by including a dummy variable when there is a 'virtual' standing charge, i.e. a zero or very small charge at nil consumption, and higher per unit charges for the first few units used. On the cost side we include the two charges which retailers pay which we can calculate from known tariffs, the distribution and transmission charges. Distribution costs form 25-30% of the final bill and vary across regions according to the charges levied by the local distribution company, but are levied equally on all suppliers using that distribution network. Distribution charges are generally in the form of a two part tariff, a charge per consumer and a charge per unit of electricity carried, and are usually higher for prepayment than for other consumers (see above for definition of payment methods). Transmission costs account for about 10% of residential final bills and vary by region. Retailers must also pay for the energy which they supply, but costs for individual retailers are confidential. However some indication of whether these costs are higher or lower than those

incurred by others might be inferred from whether the company is generally charging more or less than average across the markets, once all the other factors have been taken into account.

The fourteen areas effectively constitute separate markets (resale of electricity is impractical and usually illegal); we include characteristics of these markets, viz. the total number of consumers in the region supplied by all companies, the average income in that region and the geographical area covered. These identifiable characteristics of different regions enable us to interpret separately the effect on charges of costs and the market in each region, rather than capture all characteristics together in a single aggregate regional dummy. We allow for brand dummies which will capture any supplier specific factors which are reflected in tariffs (including costs of purchasing electricity), and test for significant differences between brands which are owned by the same company. In addition we include a dummy to represent incumbency, to capture the effects of incumbent market power. We estimated nine regressions, one for each payment method and consumption level, relating retail charges to the cost elements which we could identify, to these market characteristics and to brand and incumbency.

We have 456 sets of pricing data relating to 14 regions, 17 brand names, three payment methods and three levels of consumption. The pricing data are from the *energywatch* website. Transmission charges are from the National Grid Transco web site (National Grid Transco, 2002), and are those levied during the period 16:00 hours to 19:00 hours. Distribution charges for use of the system are published by the Electricity Association (Electricity Association 2002). We use the total annual charge levied for a typical domestic customer at each level of demand and payment method. Figures for both distribution and transmission charges were for the year 2002, the year for which our retail prices apply. Descriptive statistics are shown in table 1.

Table 1. Descriptive statistics

	Mean	Std. Dev.	Minimum Value	Maximum Value
Total charge ps/ annum for standard credit				
1650 kWh	13948	1088	11464	16871
3300 kWh	23558	1721	20043	28460
4950 kWh	33155	2530	28441	40472
Total charge ps/ annum for direct debit				
1650 kWh	13158	1169	10594	16578
3300 kWh	22493	1792	18993	27127
4950 kWh	31812	2598	27312	38792
Total charge ps/ annum for prepayment				
1650 kWh	16191	1676	12210	21936
3300 kWh	26734	2102	23031	31671
4950 kWh	37277	2833	31951	42231
Distribution charge ps/annum, non prepayment				
1650 kWh pa	3642	667	2603	5163
3300 kWh pa	5788	1096	4163	8100
4950 kWh pa	7934	1643	5598	11037
Distribution charge ps/annum for prepayment				
1650 kWh pa	4779	1151	3202	6663
3300 kWh pa	6996	1418	5156	9600
4950 kWh pa	9212	1834	7109	12537
Transmission charge ps/ annum				
1650 kWh	1878	779	293	3296
3300 kWh	3756	1559	587	6593
4950 kWh	5635	2339	881	9890
Distribution customers, 000 :	1804	663	592	3261
Size of distribution area, sq kms :	16028	11405	665	54390
Average gross income/head, £spa :	15232	1959	12743	20300

3. Methodology

The model can be written as follows for each payment type and consumption level, for supplier *j* in region *i*

$$B_{ij} = \alpha_1 + \alpha_2 TC_i + \alpha_3 DC_i + \alpha_4 area_i + \alpha_5 cust_i + \alpha_6 Y_i + \alpha_7 inc_{ij} + \alpha_8 S_j + \alpha_9 V_{ij} + \varepsilon_{ij}$$

where

B_{ij}= the bill charged in region *i* by supplier *j*

TC_i is the transmission charge in region *i*

DC_i is the distribution charge in region *i*

$area_i$ is the geographic area of region *i*

$cust_i$ is the total number of residential customers (all payment types) in region *i*

Y_i is the average income of region *i*

inc_{ij} takes the value 1 if *j* is the incumbent in area *i,* 0; otherwise

S_j takes the value 1 for *j*'s charges; 0 otherwise

V_{ij} takes the value 1 if there is more than one unit charge (i.e. there is a virtual standing charge); 0 otherwise.

If the market is competitive we would expect variations in costs across regions to be closely reflected in tariff variations, i.e. α_2 and α_3 to be close to 1. The area which the geographical market covers might affect the costs of marketing, and would be indicated by a positive value for α_4 if marketing over a greater area were more expensive. Conversely, the size of the market as measured by the total number of consumers in that distribution area and the average income of consumers are market characteristics which are unlikely to affect costs and would have little effect if the market were truly competitive, in which case α_5 and α_6 might be expected to be close to zero. If companies are targeting larger markets, or those with higher income, and have some market power, α_5 and α_6 would be negative. The prepayment market caters for lower income consumers than other tariffs, and so the relationship between prices and costs might be different. Additional power of incumbents, who had retained a market share of between 50% and 85%, would be reflected in higher tariffs, and a positive coefficient for the incumbency dummy.

We test for the ability of firms to differentiate this essentially homogeneous product by examining the significance of brand dummies. Whether a non zero brand dummy reflects mostly cost differences or mostly market power is assessed partly through consistency in the sign of the brand dummy and partly by comparing the dummy signs of brands owned by the same company and operating under different brand names in different regions.

We would expect the existence of a virtual standing charge (ie one that is very low or zero) to decrease charges at low levels of consumption, where few (higher priced) units have been consumed; and to increase them at high consumption levels, as companies try to recoup revenue which may have been lost for consumers of small amounts of electricity. We expect the tariffs for a given supplier in a particular region to be correlated across the three payment methods, and this affects the methodology used. We ran a least squares regression for each payment method separately and investigated the correlation between the estimated residuals of the three equations. The correlation coefficient between the residuals of the standard credit and direct debit equations is high and significant at 1% (0.961 at 1650kWh, 0.889 at 3300kWh and 0.915 at 4950kWh). However, between these two equations and the prepayment equation the coefficients are small and not significantly different from zero. This suggests that the prepayment market is very different from those with other forms of payment, confirming the results of earlier studies showing that consumers value the control which prepayment gives them, in addition to the commodity of electricity itself (see for example Cook et al., 2001). These results suggest we estimate a 2-equations seemingly unrelated regression equation (SURE) model for standard and direct debit tariffs at all consumption levels, with the prepayment equation estimated separately.

The estimated residual in the prepayment equation has a variance well above that in the other two equations, while the residual variances of standard and direct debit are very close to each other. Before estimating the SURE we tested for conditional heteroskedasticity *within* each equation. Indeed there is a possibility of non-constant residual variance within each equation as a result of the spatial dimension of our data. Because we don't know the structure of this heteroskedasticity, we employ the well-known White's (1980) test for heteroskedasticity of unknown form. We did not reject homoskedasticity in any equation at the 5% level of significance. Since this is also a general test for model misspecification, the results support the linear model specification for these equations. In the non parsimonious model we chose British Gas as the reference company since it is the major non incumbent player. To derive the parsimonious version, reported in tables two to four, companies were eliminated through a stepwise regression in each equation before estimating the pooled sample regression involving standard and direct debit tariffs only. It is this group of 'excluded companies' which forms the base case for the parsimonious version.

4. Results

Table 2. Parsimonious SURE results for Standard Credit; Dependent variable: annual bill

annual consumption	1650kWh	3300kWh	4950 kWh

Constant	10351.14*** (405.23)	16808.90*** (454.18)	25585.55*** (659.67)
Virtual Standing Charge dummy		532.81*** (109.87)	
Distribution charge	0.90*** (.071)	0.971*** (.053)	0.862*** (.057)
Transmission Charge	.394*** (.049)	.275*** (.028)	.252*** (.030)
Distribution area	0.015*** (0.003)	0.016*** (0.004)	0.018*** (0.006)
Distribution customers	-.421*** (0.075)	-.423*** (0.091)	-.630*** (0.141)
Incumbent	526.82*** (134.57)	1883.64*** (153.24)	2989.84*** (235.40)
Suppliers			
Amerada		461.10*** (85.02)	
Atlantic			-660.37*** (237.38)
Basic Power	343.50** (141.43)		-1771.36*** (120.71)
London	-704.41*** (135.50)		-702.54*** (116.27)
Northern	1384.02*** (489.07)	1464.23*** (556.00)	
Npower			-1485.00*** (253.67)
Powergen		932.74*** (149.43)	1001.03*** (236.35)
Scottish Hydro		1254.82*** (387.16)	1222.64*** (614.35)
Southern	-413.10*** (62.36)		
Scottish Power	530.34*** (135.34)	541.86*** (86.54)	
TXU		721.58*** (164.24)	1394.18*** (236.51)
British Gas	358.41*** (67.75)		
Adj. R^2	.831	.917	.901

Notes: *standard errors* in parentheses. **. Significant at 5%. ***. Significant at 1%.

Table 3. Parsimonious SURE results for Direct Debit; Dependent variable: annual bill

annual consumption	**1650kWh**	**3300kWh**	**4950kWh**
Constant	9297.66*** (399.15)	15838.97*** (450.27)	23963.92*** (668.10)
Virtual Standing Charge dummy	347.45*** (52.95)	484.18*** (110.16)	769.38*** (86.56)
Distribution charge	0.907*** (.070)	0.971*** (.053)	0.856*** (.058)
Transmission Charge	.383*** (.048)	.269*** (.028)	.234*** (.030)
Distribution area	0.016*** (0.003)	0.018*** (0.004)	0.019*** (0.006)
Distribution customers	-.422*** (0.074)	-.410*** (0.090)	-.655*** (0.143)
Incumbent	819.15*** (133.71)	2166.86*** (153.56)	3506.98*** (240.06)
Suppliers			
Atlantic		-1015.65*** (84.67)	-1608.45*** (240.88)
Basic Power	1396.93*** (140.25)	927.05*** (89.37)	
London	-728.22*** (134.56)	-153.34* (86.22)	
Manweb	980.66*** (196.35)	820.59*** (275.09)	1223.72*** (393.15)
Northern	1777.22*** (484.28)	2153.23*** (551.00)	
Npower	615.81*** (60.07)		-667.33*** (257.48)
SEEBOARD	-163.41** (68.09)		
Powergen		792.96*** (149.00)	1721.65*** (239.91)
Scottish Hydro	548.56*** (140.06)	1138.98*** (383.53)	1413.46*** (623.36)
Scottish Power	616.65*** (134.41)		
TXU		513.51*** (162.57)	796.44*** (244.40)
Adj. R^2	.853	.923	.904

Notes: *standard errors* in parentheses. *. Significant at 10%. **. Significant at 5%. ***. Significant at 1%.

Table 4. Parsimonious SURE results for Prepayment; Dependent variable: annual bill

annual consumption	**1650kWh**	**3300kWh**	**4950kWh**
Constant	18256.48*** (330.97)	26564.48*** (724.55)	35639.14*** (939.80)
Virtual Standing Charge dummy	-1095.60*** (305.28)		-2246.59*** (404.29)
Distribution charge		0.326*** (.07)	0.463*** (.073)
Transmission Charge			
Distribution area	-0.016** (0.008)		
Distribution customers	-1.09*** (0.138)	-1.160*** (0.162)	-1.256*** (0.203)
Incumbent			
Suppliers			
Amerada	2201.75*** (305.28)	3458.31*** (338.84)	4577.04*** (404.29)
Basic Power		-1427.37*** (362.72)	-3442.09*** (432.59)
London			-835.25** (417.81)
Npower	2671.31*** (326.95)	1225.58*** (362.44)	
Powergen	-1379.71*** (305.28)	-1865.18*** (338.84)	-2548.48*** (404.29)
British Gas (BG)		-1602.18*** (338.84)	
Adj. R^2	.593	.687	.755

Notes: *standard errors* in parentheses. **. Significant at 5%. ***. Significant at 1%.

The results are shown in tables 2 to 4. In the parsimonious equations, three brands act as the base group across all equations, namely SWALEC, SWEB and Yorkshire, all regional incumbents offering tariffs only in their local areas, and owned by companies operating under other brand names elsewhere. For each consumption level and payment method we see that other brands, without dummy coefficients significantly different from zero, are indistinguishable from this base group. For standard credit these are SEEBOARD and Manweb; and for Direct Debit, British Gas, Amerada and Southern. In the prepayment market there is a much larger reference group whose charges are indistinguishable from each other and the reference group, once other factors have been taken into account, and include Atlantic, Manweb, Northern, SEEBOARD, Scottish Power, Scottish Hydro and TXU. These last two are particularly interesting because the extra charges they were allowed to levy for prepayment rather than credit consumers in their home region was smaller than

for other incumbents under the regulation which was removed at the time when the charges which we analyse were levied.

The constant in each equation can be regarded in some sense as the 'base' charge for the generation and retail services of a company in the 'reference' group if it were not incumbent, and without any allowance for the area and number of customers. As expected, this increases for higher consumption within each payment method and for each consumption level is highest for prepayment and lowest for direct debit payment, reflecting our expectations about the relative costs of supplying different consumption levels and payment methods.

On the cost side we see that at all levels of consumption, distribution and transmission charges have a positive coefficient for standard credit and direct debit payment. Distribution costs are passed through virtually 100% (few of the coefficients are significantly different from unity at 5% significance). The lower coefficient for transmission charges, around one third, is consistent with their reflection of charges for the three evening hours from 16:00 to 19:00 hours. These are the peak hours for residential consumption, and if around a third of consumption takes place at this period, this would again indicate close to 100% pass through of costs in these markets. The exception is the prepayment market, where the coefficient for distribution charges is much lower, and not significantly different from zero at low consumption levels; and transmission charge coefficients are not significantly different from zero at any of the consumption levels. The disassociation between costs and charges in this market suggests it is much further from being competitive than for the other two payment methods.

Costs may also differ with the area covered by a distribution market, a negative coefficient indicating economies of size, and a positive coefficient suggesting higher costs if there is a larger area to cover, most likely in marketing. We see positive coefficients for standard credit and direct payment, suggesting some diseconomies of area, with very similar coefficients for these two payment methods at all consumption levels. But geographic area has no effect on prepayment charges except at low consumption levels where the effect is negative, suggesting either that there are no higher costs for these consumers associated with larger areas (reflecting the much lower level of marketing activity to this group) or that such costs are not passed on in charges. Either interpretation indicates less intense competition in this market.

In terms of market characteristics, we see that lower charges are associated with larger markets as measured by numbers in the distribution region. To the extent that each supplier would generally

have more consumers in a larger total market, this may reflect some economies of scale for each operator within a market; but is more likely to reflect market power. At each consumption level we see that the coefficient for prepayment consumers is twice as high as that for the other two tariffs, again suggesting that any market power is higher. However the average income in each market did not affect charges at any consumption level or payment type.

For both credit and direct debit the incumbency coefficient is positive, suggesting additional charges of between 4% and 13% levied by the incumbent when other factors are taken into account. This is a little lower than the 'best offers' table in the 2002 Ofgem report, because our analysis identifies a broader range of factors affecting charges.. The mark up varies between these two payment methods in an interesting way. At all consumption levels it is highest for direct debit consumers, where net consumer switching has been greatest, 46% in January 2003, the latest date for which such detailed figures are available (Ofgem, 2003). One interpretation is that the mark up is a disequilibrium phenomenon which reflects competition from entrants undercutting the incumbent, rather than an equilibrium level of relative prices, which would indicate incumbent power. Such an interpretation is supported by the zero incumbency coefficient for prepayment, perhaps reflecting the lower level of interest from entrants in this market, rather than an equilibrium competitive price.

Alternatively, the failure of incumbents to lower their prices to meet competition could be interpreted as exercising market power over their captive incumbent customers. It may be profitable for them to maintain prices above those of entrants, because the marginal losses in revenue from lowering price to non switchers exceeds the marginal gain from losing fewer customers to entrants (see Griulietti et al., 2003). Companies are confronted by this trade off because they are constrained to charge all customers according to their published tariff.

While electricity is essentially a homogeneous product, companies make great efforts to differentiate their services, and we explored whether the price relationship varies between brands, apart from incumbency. The brand dummies will partly reflect differences in the unknown (to us) generation costs, and partly differences in pricing strategy, to the extent that market power enables these to be implemented through price differences. Coefficients of the same sign for all payment methods and consumption levels would suggest that generation cost differences are the predominant factor, particularly where they are also similar across brands in common ownership. Where they vary across markets for brands and companies this is more likely to indicate different strategies in different markets, as compared with the reference group.

First we examined similarities of coefficients within each brand name across all the markets which that brand serves. While nine of the brands outside the reference group reveal consistent differences in sign from the reference group, this is not so for the three largest national suppliers, namely Powergen, Npower and British Gas; nor for SEEBOARD and one of the smaller entrants, Basic Power. For each of these five brands, charges to some markets are significantly higher and in others significantly lower than for the base group, after allowing for general cost and market influences. We therefore deduce that the differences are at least in part related to company attempts to target different markets, and not merely cost reflective.

Across the market as a whole the model identifies more brand differentiation for standard credit and direct debit than for prepayment, with more brand dummies significantly different from the base group for these payment methods than for prepayment. Of the incumbent brands with wide coverage who are not in the base group, London charges less (or similar) in all markets, and Scottish Power, Scottish Hydro and TXU charge more or the same. Npower charges more to consumers of small quantities, and less to large consumers in standard credit and direct debit markets; while Powergen charges more to credit and direct debit customers and less to prepayment customers. All these variations suggest some market power across markets, with differential approaches to each market by different companies.

Table 5 shows the ownership pattern for different brands. Insofar as differences in these dummies reflect different costs of electricity purchase, we would expect these to be similar both across brand names and between different brand names within the same ownership group. There seems to be some weak support for this, even though the base group itself includes members from three different consolidated groups. Amongst the other ownership groups, Manweb and Scottish Power both have higher charges; and the Npower group, which includes Northern and Yorkshire, makes higher charges to some markets and lower to others than the base group. We conclude that there is sufficient variety both within brands and within ownership groups to suggest that at least some of the price difference is related to market strategies, indicating an attempt to differentiate brands and suggesting the presence and exercise of market power.

Table 5: Electricity supply brand names within the same ownership group

Group Identity	
A	London, SWEB, SEEBOARD*
B	Manweb, Scottish Power
C	Northern, Npower (incumbent in Midlands), Yorkshire

D	Scottish Hydro, Southern, SWALEC
E	PowerGen (incumbent in East Midlands), TXU* (incumbent in Eastern and Northweb regions)

* acquired after April 2002, when the data analysed here were gathered; source Electricity Association, 2003

Comparisons of tariff differences with the percentage of consumers who have switched away from the incumbent suppliers is complicated by the particular characteristics of the Scottish market, where competition has been much slower to develop, particularly in the Scottish Hydro region in the north of the country. To some extent the higher charges by the two Scottish companies may partly be a reflection of greater residual incumbent power because of this delay. The most successful entrant into the market is British Gas, which makes lower charges to medium sized prepayment and higher charges to low volume standard credit consumers. Other entrants (Amerada, Atlantic and Basic Power) all show some differences across markets. Basic Power is cheaper for some standard credit and prepayment consumers, but more expensive for direct debit; while Atlantic is cheaper for both credit tariffs, and Amerada is more expensive for prepayment and some credit users, suggesting selective targeting by niche suppliers.

Finally we examined the effect of having a reduced standing charge, but a higher running rate for the first few units. A small or absent standing charge tended to raise prices for all direct debit payers and medium consumption standard credit users; but it had no effect on users of small or large amounts of electricity paying by standard credit, and decreased the price, relative to more traditional two part tariffs, for small and large prepayment users.

5. Conclusions

The most remarkable difference in the general pattern of charges is the one we observe between the two credit and the prepayment tariffs. The coefficients of all the cost and market variables in the credit and direct debit equations are very similar, with the only significant differences in some of the constant and incumbency coefficients and the shift associated with multipart tariffs. The smaller constant for direct debit reflects the lower retailing costs associated with such payment. The overall fit of the prepayment equations suggests that there are some omitted variables, probably the effect of previous regulatory policy. Both credit and prepayment tariffs had been regulated immediately prior to the date these charges were levied, while direct debit tariffs had been deregulated previously. In particular, the difference between charges made by incumbents to the prepayment and credit markets was capped at £15 in all regions, but with a lower difference imposed on the Eastern and Scottish Hydro regions (£11.22 and 0 respectively). Our results indicate that this has translated into higher charges by TXU and Scottish Hydro in the credit market, rather than to lower charges for prepayment consumers, for whose protection these restrictions were designed. The similarity between the direct debit and standard credit models, and their difference from the prepayment, is even more remarkable in the light of the regulatory experience outlined above, and reflects long term historical differences as well as informal political pressure to reduce charges in the prepayment market.

Overall we observe that charges are much more closely related to cost factors in the standard credit and direct debit market. In the prepayment market some costs are only partially passed through, while others appear to have no effect on the charges levied. But the size of the market seems to have a much greater effect on prepayment charges than in the other markets. This leads us to believe that there is more general market power in the prepayment market, where marketing is less aggressive and fewer consumers have switched (33% compared with 46% for the direct debit market, Ofgem, 2003). However we find little evidence that the *incumbent* has any additional market power, beyond that identified above, in the prepayment market, where their charges did not seem to be significantly higher than others (confirming the lack of interest by entrants in supplying this market).

In contrast, the charges in the direct debit and credit markets appeared to be much more closely related to costs in general. However the incumbency dummy is significant and positive in these markets, with the proportional mark up highest for direct debit payers with high levels of consumption, similar to the results in Ofgem, 2003. This could be interpreted as indicating some

continuing market power of incumbents, identified in Otero and Waddams Price (2001a), and in Giulietti et al (2003), both using earlier data. However we note that the mark ups are higher both in absolute and relative terms for those payment methods where most switching has occurred, suggesting that caution is needed in interpreting the incumbency dummy as a direct indication of market power. It may instead illustrate a disequilibrium situation with active competition from entrants undercutting the incumbent. More likely we suggest that the markets are effectively bifurcated, with some consumers resistant to switching, so the incumbent mark-up indicates exploitation of market power for these non-switchers. This raises distributional concerns insofar as this part of the market generally has lower income than those who switch (Giulietti et al, 2003).

The smaller number of 'brand specific' influences in prepayment (only half the number of brand dummies significantly different from zero, compared with other payment methods) may represent lackadaisical competition in prepayment, where companies use price taking as a non-competitive default in a market where they are obliged to offer tariffs. Where tariffs with fixed charges have been replaced by tariffs with an initial high running rate, some consumers paying by credit or direct debit face rather higher charges, while most prepayment consumers pay less under such tariffs. This is further evidence that the credit market (including direct debit) is a separate market from that for prepayment and that consumers see the provision of prepayment as offering a distinct and additional service, compared with credit payment. Across the variables we see considerable similarity between direct debit and standard credit tariff structures, and corresponding differences between them and the prepayment structure.

As the final price controls were removed from retail electricity tariffs when these charges were the prevailing prices, the results raise important issues for future regulation of the market under the provisions of the Competition Act 1998. We find evidence of both general and incumbent market power exercised in these markets, which suggests that the regulator needs to monitor the charges and their changes over time. Incumbent mark ups in direct debit and credit markets raise concerns for potential exploitation of nonswitchers; and their absence, as in the prepayment market, together with other indications of market power, suggests a generalised market power for this payment method. Ofgem's latest paper (2003) reports that both switching rates and awareness of competitive possibilities are falling in this market. There are other signs that companies intend to compete less fiercely. During 2003 British Gas has reduced its sales force by half, and three of the other five major suppliers have made similar moves which can be interpreted as focusing on areas where they are dominant, rather than fighting for new customers out of their home regions (energywatch, 2003). Such announcements may be signalling such an intention to potential

competitors, and a general agreement among companies to play a ‘puppy dog’ strategy out of their incumbent areas (Fudenberg and Tirole, 1984), a ploy which is likely to be particularly easy to introduce and enforce through the repeated interaction of suppliers across so many regional markets. In these circumstances, continuation of incumbent mark ups raises distributive concerns for particular groups of consumers who are less likely to switch and so gain from the competitive process. This should be of particular concern to the regulator and the consumer watchdog, both of whom have statutory duties to take account of the needs of certain potentially vulnerable household categories. Both non switchers and prepayers have lower than average income. While the Ofgem report of June 2003 claims that prices are set by competitive forces, our more disaggregated analysis of charges indicates that substantial market power remains and the regulator needs to be remain alert to potential abuse, on grounds of both efficiency and equity.

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